

What is claimed is:

1 1. A semiconductor laser array apparatus comprising:  
2 a substrate;  
3 a plurality of current blocking elements that are stripe  
4 shaped and are formed on the substrate; and  
5 a plurality of light waveguides that are formed between  
6 the plurality of current blocking elements,  
7 wherein at least two adjacent light waveguides are  
8 optically connected by removing a part of each current blocking  
9 element therebetween.

1 2. The semiconductor laser array apparatus of Claim 1,  
2 wherein each removed part is a groove and physically  
3 connects the at least two adjacent light waveguides, and  
4 a connection waveguide is formed in each removed part,  
5 wherein the at least two adjacent waveguides are  
6 optically connected by each connection waveguide.

1 3. The semiconductor laser array apparatus of Claim 2,  
2 wherein each connection waveguide is arranged so that  
3 an extension direction of the connection waveguide crosses  
4 extension directions of the at least two adjacent light  
5 waveguides.

1 4. The semiconductor laser array apparatus of Claim 3,

2           wher in nd parts of each connection waveguide are  
3 bent so that the connection waveguide smoothly merges with  
4 the at least two adjacent light waveguides.

1   5. A semiconductor laser array apparatus comprising:  
2           a substrate;  
3           aplurality of current blocking elements that are formed  
4 on the substrate; and  
5           a plurality of light waveguides that are formed between  
6 the plurality of current blocking elements,  
7           wherein at least two adjacent light waveguides are  
8 bent and connected via at least one point.

1   6. A semiconductor laser array apparatus comprising:  
2           a substrate that includes a first end face and a second  
3 end face opposing to each other;  
4           a current blocking element that is formed on the  
5 substrate, first grooves and second grooves being formed in  
6 the current blocking element, the first grooves extending in  
7 parallel from the first end face toward the second end face,  
8 and the second grooves extending in parallel from the second  
9 end face toward the first end face;  
10           first light waveguides that are respectively formed  
11 in the first grooves; and  
12           second light waveguides that are respectively formed  
13 in the second grooves,

14            wherein the first and second light waveguides are  
15 alternatively arranged in an arrangement direction thereof.

1    7. The semiconductor laser array apparatus of Claim 6, further  
2 comprising:

3            a p-type sheet electrode; and

4            an n-type sheet electrode,

5            wherein the plurality of current blocking elements  
6 and the light waveguides are sandwiched between the p-type  
7 sheet electrode and the n-type sheet electrode.

1    8. The semiconductor laser array apparatus of Claim 5, further  
2 comprising:

3            a p-type sheet electrode; and

4            an n-type sheet electrode,

5            wherein the plurality of current blocking elements  
6 and the light waveguides are sandwiched between the p-type  
7 sheet electrode and the n-type sheet electrode.

1    9. The semiconductor laser array apparatus Claim 1, further  
2 comprising:

3            a p-type sheet electrode; and

4            an n-type sheet electrode,

5            wherein the plurality of current blocking elements  
6 and the light waveguides are sandwiched between the p-type  
7 sheet electrode and the n-type sheet electrode.

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1 10. The semiconductor laser array apparatus of Claim 6, further  
2 comprising:

3 a window-mirror structure that is established at each  
4 end part of the apparatus that includes end parts of the light  
5 waveguides.

1 11. The semiconductor laser array apparatus of Claim 5, further  
2 comprising:

3 a window-mirror structure that is established at each  
4 end part of the apparatus that includes end parts of the light  
5 waveguides..

1 12. The semiconductor laser array apparatus of Claim 1, further  
2 comprising:

3 a window-mirror structure that is established at each  
4 end part of the apparatus that includes end parts of the light  
5 waveguides.

1 13. The semiconductor laser array apparatus of Claim 12, further  
2 comprising:

3 an insulating part that is formed at each area where  
4 an electric power is applied to a surface of the window-mirror  
5 structure.

1 14. The semiconductor laser array apparatus of Claim 11, further

2 comprising:

3           an insulating part that is formed at each area where  
4 an electric power is applied to a surface of the window-mirror  
5 structure.

1 15. The semiconductor laser array apparatus of Claim 10, further  
2 comprising:

3           an insulating part that is formed at each area where  
4 an electric power is applied to a surface of the window-mirror  
5 structure.

1 16. The semiconductor laser array apparatus of Claim 6,  
2           wherein a forbidden band width of each current blocking  
3 element is larger than a forbidden band width of an active  
4 layer of each light waveguide, and  
5           a refractive index of each current blocking element  
6 is smaller than a refractive index of each light waveguide.

1 17. The semiconductor laser array apparatus of Claim 5,  
2           wherein a forbidden band width of each current blocking  
3 element is larger than a forbidden band width of an active  
4 layer of each light waveguide, and  
5           a refractive index of each current blocking element  
6 is smaller than a refractive index of each light waveguide.

1 18. The semiconductor laser array apparatus of Claim 1,

2            wherein a forbidden band width of each current blocking  
3 element is larger than a forbidden band width of an active  
4 layer of each light waveguide, and  
5            a refractive index of each current blocking element  
6 is smaller than a refractive index of each light waveguide.

1 19. A multi-wavelength laser light emitting apparatus  
2 comprising:

3            a plurality of semiconductor laser array apparatuses,  
4 each of which emits a laser light of a different wavelength;  
5 and

6            an optical component that condenses each emitted laser  
7 light at a predetermined point,

8            wherein at least one of the plurality of semiconductor  
9 laser array apparatuses includes a laser array structure where  
10 a plurality of light waveguides are formed between a plurality  
11 of current blocking elements, and

12            at least two adjacent light waveguides are optically  
13 connected to each other.

1 20. The multi-wavelength laser light emitting apparatus of  
2 Claim 19, further comprising:

3            an adjusting means for displacing the optical component  
4 to condense each emitted laser light at the predetermined point;

5            a laser driving means for selecting and exciting a  
6 semiconductor laser array apparatus that emits a laser light

7 of a specified wavelength; and  
 8 a control means for controlling the adjusting means  
 9 according to the specified wavelength.

1 21. The multi-wavelength laser light emitting apparatus of  
 2 Claim 20,  
 3 wherein each of the plurality of semiconductor laser  
 4 array apparatuses includes:  
 5 a substrate;  
 6 a plurality of current blocking elements that are stripe  
 7 shaped and are formed on the substrate; and  
 8 a plurality of light waveguides that are formed between  
 9 the plurality of current blocking elements,  
 10 wherein at least two adjacent light waveguides are  
 11 optically connected by removing a part of each current blocking  
 12 element therebetween.

1 22. The multi-wavelength laser light emitting apparatus of  
 2 Claim 20,  
 3 wherein each of the plurality of semiconductor laser  
 4 array apparatuses includes:  
 5 a substrate;  
 6 a plurality of current blocking elements that are formed  
 7 on the substrate; and  
 8 a plurality of light waveguides that are formed between  
 9 the plurality of current blocking elements,

10 wherein at least two adjacent light waveguides are  
11 bent and connected via at least one point.

1 23. The multi-wavelength laser light emitting apparatus of  
2 Claim 20,

3 wherein each of the plurality of semiconductor laser  
4 array apparatuses includes:

5 a substrate that includes a first end face and a second  
6 end face opposing to each other;

7 a current blocking element that is formed on the  
8 substrate, first grooves and second grooves being formed in  
9 the current blocking element, the first grooves extending in  
10 parallel from the first end face toward the second end face,  
11 and the second grooves extending in parallel from the second  
12 end face toward the first end face;

13 first light waveguides that are respectively formed  
14 in the first grooves; and

15 second light waveguides that are respectively formed  
16 in the second grooves,

17 wherein the first and second light waveguides are  
18 alternatively arranged in an arrangement direction thereof.

1 24. A laser welding apparatus that welds a target by irradiating  
2 the target with laser lights emitted from a semiconductor laser  
3 array apparatus,

4 the semiconductor laser array apparatus including:



5           a substrate;  
6           a plurality of current blocking elements that are stripe  
7 shaped and are formed on the substrate; and  
8           a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,  
10          wherein at least two adjacent light waveguides are  
11 optically connected by removing a part of each current blocking  
12 element therebetween.

1   25. A laser welding apparatus that welds a target by irradiating  
2 the target with laser lights emitted from a semiconductor laser  
3 array apparatus,  
4          the semiconductor laser array apparatus including:  
5          a substrate;  
6          a plurality of current blocking elements that are formed  
7 on the substrate; and  
8          a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,  
10          wherein at least two adjacent light waveguides are  
11 bent and connected via at least one point.

1   26. A laser welding apparatus that welds a target by irradiating  
2 the target with laser lights emitted from a semiconductor laser  
3 array apparatus,  
4          the semiconductor laser array apparatus including:  
5          a substrate that includes a first end face and a second

6 end face opposing to each other;

7 a current blocking element that is formed on the  
8 substrate, first grooves and second grooves being formed in  
9 the current blocking element, the first grooves extending in  
10 parallel from the first end face toward the second end face,  
11 and the second grooves extending in parallel from the second  
12 end face toward the first end face;

13 first light waveguides that are respectively formed  
14 in the first grooves; and

15 second light waveguides that are respectively formed  
16 in the second grooves,

17 wherein the first and second light waveguides are  
18 alternatively arranged in an arrangement direction thereof.

1 27. A two-dimensional matrix data generating apparatus that  
2 generates two-dimensional matrix data by irradiating a target  
3 with laser lights emitted from a semiconductor laser array  
4 apparatus,

5 the semiconductor laser array apparatus including:

6 a substrate;

7 a plurality of current blocking elements that are stripe  
8 shaped and are formed on the substrate; and

9 a plurality of light waveguides that are formed between  
10 the plurality of current blocking elements,

11 wherein at least two adjacent light waveguides are  
12 optically connected by removing a part of each current blocking

13 element therebetween.

1 28. A two-dimensional matrix data generating apparatus that  
2 generates two-dimensional matrix data by irradiating a target  
3 with laser lights emitted from a semiconductor laser array  
4 apparatus,

5 the semiconductor laser array apparatus including:

6 a substrate;

7 a plurality of current blocking elements that are formed  
8 on the substrate; and

9 a plurality of light waveguides that are formed between  
10 the plurality of current blocking elements,

11 wherein at least two adjacent light waveguides are  
12 bent and connected via at least one point.

1 29. A two-dimensional matrix data generating apparatus that  
2 generates two-dimensional matrix data by irradiating a target  
3 with laser lights emitted from a semiconductor laser array  
4 apparatus,

5 the semiconductor laser array apparatus including:

6 a substrate that includes a first end face and a second  
7 end face opposing to each other;

8 a current blocking element that is formed on the  
9 substrate, first grooves and second grooves being formed in  
10 the current blocking element, the first grooves extending in  
11 parallel from the first end face toward the second end face,

12 and the second grooves extending in parallel from the second  
13 end face toward the first end face;

14 first light waveguides that are respectively formed  
15 in the first grooves; and

16 second light waveguides that are respectively formed  
17 in the second grooves,

18 wherein the first and second light waveguides are  
19 alternatively arranged in an arrangement direction thereof.

1 30. A semiconductor laser scalpel apparatus that performs  
2 hemostasis or an incision on a living body by irradiating the  
3 living body with laser lights emitted from a semiconductor  
4 laser array apparatus,

5 the semiconductor laser array apparatus including:

6 a substrate;

7 a plurality of current blocking elements that are stripe  
8 shaped and are formed on the substrate; and

9 a plurality of light waveguides that are formed between  
10 the plurality of current blocking elements,

11 wherein at least two adjacent light waveguides are  
12 optically connected by removing a part of each current blocking  
13 element therebetween.

1 31. A semiconductor laser scalpel apparatus that performs  
2 hemostasis or an incision on a living body by irradiating the  
3 living body with laser lights emitted from a semiconductor

4 laser array apparatus,  
 5 the semiconductor laser array apparatus including:  
 6 a substrate;  
 7 a plurality of current blocking elements that are formed  
 8 on the substrate; and  
 9 a plurality of light waveguides that are formed between  
 10 the plurality of current blocking elements,  
 11 wherein at least two adjacent light waveguides are  
 12 bent and connected via at least one point.

1 32. A semiconductor laser scalpel apparatus that performs  
 2 hemostasis or an incision on a living body by irradiating the  
 3 living body with laser lights emitted from a semiconductor  
 4 laser array apparatus,  
 5 the semiconductor laser array apparatus including:  
 6 a substrate that includes a first end face and a second  
 7 end face opposing to each other;  
 8 a current blocking element that is formed on the  
 9 substrate, first grooves and second grooves being formed in  
 10 the current blocking element, the first grooves extending in  
 11 parallel from the first end face toward the second end face,  
 12 and the second grooves extending in parallel from the second  
 13 end face toward the first end face;  
 14 first light waveguides that are respectively formed  
 15 in the first grooves; and  
 16 second light waveguides that are respectively formed

17 in the second grooves,

18 wherein the first and second light waveguides are  
19 alternatively arranged in an arrangement direction thereof.

1 33. A tumor treatment apparatus that performs treatment of  
2 a tumor by irradiating a living body, into which photofrin  
3 has been injected, with laser lights emitted from a semiconductor  
4 laser array apparatus,

5 the semiconductor laser array apparatus including:

6 a substrate;

7 a plurality of current blocking elements that are stripe  
8 shaped and are formed on the substrate; and

9 a plurality of light waveguides that are formed between  
10 the plurality of current blocking elements,

11 wherein at least two adjacent light waveguides are  
12 optically connected by removing a part of each current blocking  
13 element therebetween.

1 34. A tumor treatment apparatus that performs treatment of  
2 a tumor by irradiating a living body, into which photofrin  
3 has been injected, with laser lights emitted from a semiconductor  
4 laser array apparatus,

5 the semiconductor laser array apparatus including:

6 a substrate;

7 a plurality of current blocking elements that are formed  
8 on the substrate; and

9 a plurality of light waveguides that are formed between  
10 the plurality of current blocking elements,  
11 wherein at least two adjacent light waveguides are  
12 bent and connected via at least one point.

1 35. A tumor treatment apparatus that performs treatment of  
2 a tumor by irradiating a living body, into which photofrin  
3 has been injected, with laser light emitted from a semiconductor  
4 laser array apparatus,

5 the semiconductor laser array apparatus including:  
6 a substrate that includes a first end face and a second  
7 end face opposing to each other;

8 a current blocking element that is formed on the  
9 substrate, first grooves and second grooves being formed in  
10 the current blocking element, the first grooves extending in  
11 parallel from the first end face toward the second end face,  
12 and the second grooves extending in parallel from the second  
13 end face toward the first end face;

14 first light waveguides that are respectively formed  
15 in the first grooves; and

16 second light waveguides that are respectively formed  
17 in the second grooves,

18 wherein the first and second light waveguides are  
19 alternatively arranged in an arrangement direction thereof.

1 36. A hair restoration treatment apparatus that performs hair

2 restoration treatment by irradiating a head with laser lights  
3 emitted from a semiconductor laser array apparatus,  
4 the semiconductor laser array apparatus including:  
5 a substrate;  
6 a plurality of current blocking elements that are stripe  
7 shaped and are formed on the substrate; and  
8 a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,  
10 wherein at least two adjacent light waveguides are  
11 optically connected by removing a part of each current blocking  
12 element therebetween.

1 37. A hair restoration treatment apparatus that performs hair  
2 restoration treatment by irradiating a head with laser lights  
3 emitted from a semiconductor laser array apparatus,  
4 the semiconductor laser array apparatus including:  
5 a substrate;  
6 a plurality of current blocking elements that are formed  
7 on the substrate; and  
8 a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,  
10 wherein at least two adjacent light waveguides are  
11 bent and connected via at least one point.

1 38. A hair restoration treatment apparatus that performs hair  
2 restoration treatment by irradiating a head with laser lights



emitted from a semiconductor laser array apparatus,  
the semiconductor laser array apparatus including:  
a substrate that includes a first end face and a second  
end face opposing to each other;  
a current blocking element that is formed on the  
substrate, first grooves and second grooves being formed in  
the current blocking element, the first grooves extending in  
parallel from the first end face toward the second end face,  
and the second grooves extending in parallel from the second  
end face toward the first end face;  
first light waveguides that are respectively formed  
in the first grooves; and  
second light waveguides that are respectively formed  
in the second grooves,  
wherein the first and second light waveguides are  
alternatively arranged in an arrangement direction thereof.

39. A detached retina treatment apparatus that performs  
treatment of a detached retina by irradiating the detached  
retina with laser lights emitted from a semiconductor laser  
array apparatus,  
the semiconductor laser array apparatus including:  
a substrate;  
a plurality of current blocking elements that are stripe  
shaped and are formed on the substrate; and  
a plurality of light waveguides that are formed between

10 the plurality of current blocking elements,  
11 wherein at least two adjacent light waveguides are  
12 optically connected by removing a part of each current blocking  
13 element therebetween.

1 40. A detached retina treatment apparatus that performs  
2 treatment of a detached retina by irradiating the detached  
3 retina with laser lights emitted from a semiconductor laser  
4 array apparatus,

5 the semiconductor laser array apparatus including:  
6 a substrate;

7 a plurality of current blocking elements that are formed  
8 on the substrate; and

9 a plurality of light waveguides that are formed between  
10 the plurality of current blocking elements,

11 wherein at least two adjacent light waveguides are  
12 bent and connected via at least one point.

1 41. A detached retina treatment apparatus that performs  
2 treatment of a detached retina by irradiating the detached  
3 retina with laser lights emitted from a semiconductor laser  
4 array apparatus,

5 the semiconductor laser array apparatus including:

6 a substrate that includes a first end face and a second  
7 end face opposing to each other;

8 a current blocking element that is formed on the

9 substrate, first grooves and second grooves being formed in  
10 the current blocking element, the first grooves extending in  
11 parallel from the first end face toward the second end face,  
12 and the second grooves extending in parallel from the second  
13 end face toward the first end face;

14 first light waveguides that are respectively formed  
15 in the first grooves; and

16 second light waveguides that are respectively formed  
17 in the second grooves,

18 wherein the first and second light waveguides are  
19 alternatively arranged in an arrangement direction thereof.

1 42. A nearsightedness treatment apparatus that performs  
2 nearsightedness treatment by irradiating a cornea with laser  
3 lights emitted from a semiconductor laser array apparatus,

4 the semiconductor laser array apparatus including:  
5 a substrate;

6 a plurality of current blocking elements that are stripe  
7 shaped and are formed on the substrate; and

8 a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,

10 wherein at least two adjacent light waveguides are  
11 optically connected by removing a part of each current blocking  
12 element therebetween.

1 43. A nearsightedness treatment apparatus that performs

2   nearsightedness treatment by irradiating a cornea with laser  
3   lights emitted from a semiconductor laser array apparatus,  
4       the semiconductor laser array apparatus including:  
5       a substrate;  
6       a plurality of current blocking elements that are formed  
7   on the substrate; and  
8       a plurality of light waveguides that are formed between  
9   the plurality of current blocking elements,  
10       wherein at least two adjacent light waveguides are  
11   bent and connected via at least one point.

1   44. A nearsightedness treatment apparatus that performs  
2   nearsightedness treatment by irradiating a cornea with laser  
3   lights emitted from a semiconductor laser array apparatus,  
4       the semiconductor laser array apparatus including:  
5       a substrate that includes a first end face and a second  
6   end face opposing to each other;  
7       a current blocking element that is formed on the  
8   substrate, first grooves and second grooves being formed in  
9   the current blocking element, the first grooves extending in  
10   parallel from the first end face toward the second end face,  
11   and the second grooves extending in parallel from the second  
12   end face toward the first end face;  
13       first light waveguides that are respectively formed  
14   in the first grooves; and  
15       second light waveguides that are respectively formed

16 in the second grooves,

17 wherein the first and second light waveguides are  
18 alternatively arranged in an arrangement direction thereof.

1 45. A punching and cutting apparatus that punches and cuts  
2 a target by irradiating the target with laser lights emitted  
3 from a semiconductor laser array apparatus,

4 the semiconductor laser array apparatus including:

5 a substrate;

6 a plurality of current blocking elements that are stripe  
7 shaped and are formed on the substrate; and

8 a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,

10 wherein at least two adjacent light waveguides are  
11 optically connected by removing a part of each current blocking  
12 element therebetween.

1 46. A punching and cutting apparatus that punches and cuts  
2 a target by irradiating the target with laser lights emitted  
3 from a semiconductor laser array apparatus,

4 the semiconductor laser array apparatus including:

5 a substrate;

6 a plurality of current blocking elements that are formed  
7 on the substrate; and

8 a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,

10            wherein at least two adjacent light waveguides are  
11    b nt and connected via at least one point.

1    47. A punching and cutting apparatus that punches and cuts  
2    a target by irradiating the target with laser lights emitted  
3    from a semiconductor laser array apparatus,

4            the semiconductor laser array apparatus including:  
5            a substrate that includes a first end face and a second  
6    end face opposing to each other;

7            a current blocking element that is formed on the  
8    substrate, first grooves and second grooves being formed in  
9    the current blocking element, the first grooves extending in  
10   parallel from the first end face toward the second end face,  
11   and the second grooves extending in parallel from the second  
12   end face toward the first end face;

13           first light waveguides that are respectively formed  
14   in the first grooves; and

15           second light waveguides that are respectively formed  
16   in the second grooves,

17           wherein the first and second light waveguides are  
18   alternatively arranged in an arrangement direction thereof.

1    48. A surface denaturation processing apparatus that performs  
2    surface denaturation processing by irradiating a target with  
3    laser lights emitted from a semiconductor laser array apparatus,

4            the semiconductor laser array apparatus including:

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5           a substrate;  
6           a plurality of current blocking elements that are stripe  
7 shaped and are formed on the substrate; and  
8           a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,  
10          wherein at least two adjacent light waveguides are  
11 optically connected by removing a part of each current blocking  
12 element therebetween.

1   49. A surface denaturation processing apparatus that performs  
2 surface denaturation processing by irradiating a target with  
3 laser lights emitted from a semiconductor laser array apparatus,  
4          the semiconductor laser array apparatus including:  
5          a substrate;  
6          a plurality of current blocking elements that are formed  
7 on the substrate; and  
8          a plurality of light waveguides that are formed between  
9 the plurality of current blocking elements,  
10          wherein at least two adjacent light waveguides are  
11 bent and connected via at least one point.

1   50. A surface denaturation processing apparatus that performs  
2 surface denaturation processing by irradiating a target with  
3 laser lights emitted from a semiconductor laser array apparatus,  
4          the semiconductor laser array apparatus including:  
5          a substrate that includes a first end face and a second

6 end face opposing to each other;  
7 a current blocking element that is formed on the  
8 substrate, first grooves and second grooves being formed in  
9 the current blocking element, the first grooves extending in  
10 parallel from the first end face toward the second end face,  
11 and the second grooves extending in parallel from the second  
12 end face toward the first end face;  
13 first light waveguides that are respectively formed  
14 in the first grooves; and  
15 second light waveguides that are respectively formed  
16 in the second grooves,  
17 wherein the first and second light waveguides are  
18 alternatively arranged in an arrangement direction thereof.